

On a new Method of Illuminating Opaque Objects, for the high powers of the Microscope; and on a new Achromatic Condenser.
By J. L. RIDDELL.

The front or terminal combination of the objective is made to condense light upon the opaque object, by sending rays of light from behind, through the marginal border of the lens.

To accomplish this, a circular disk of fine plate glass, say near a fourth or fifth part as thick as the diameter of the lens, is bevelled on its outer margin, by grinding and polishing to an angle of 45° . A hole is drilled through the centre of the disk, of a diameter, say two-thirds, three-fourths or four-fifths (dependent upon the angle of aperture), as great as that of the lens. The margin of this hole is also bevelled at an angle of 45° , down to a clean sharp edge. Both rings of bevels are on the same side of the glass, so that if considered as projected, the lines would cross each other at right angles.

I find no insurmountable difficulty in giving an exquisite form and finish to these disks. I mount and revolve the disk on a good rose lathe; at the same time the grinding or polishing tool is revolved by an overhead motion, the spindle carrying the tool being mounted upon a slide-rest, and admitting of a protrusive movement at an angle of 45° to the axis of the lathe.

The disk, being finished, is to be placed centrally behind the lens, the bevelled margins looking backward, and the sharp inner edge almost or quite touching the lens. Parallel rays of light being thrown upon the disk, in the direction of the axis of the objective, from below in the direct, from above in the inverted microscope, a ring of parallel rays is sent, by two successive internal reflections from the bevelled surfaces, so that, with direction reversed, the light traverses the outer margin of the objective, and by it is condensed upon the object in focus.

I tested this method of illumination in March last, sufficiently to be satisfied of its great value; more especially where the objective is of very short focal distance, and where consequently other means of illuminating opaque objects cannot, on account of the nearness of the objective to the object, be resorted to.

New kind of Achromatic Condenser suggested.

A larger, thicker, similarly bevelled disk, with the bevels on opposite sides of the plate glass, and their lines of inclination coincident, would probably serve as an efficient achromatic condenser of parallel rays. By attaching centrally, on the side opposite the bevel, achromatic lenses of proper size, or a good doublet combination, a most valuable form of achromatic condenser would I think be produced, useful for general microscopic illumination. I have not yet put the plan in practice.—*Silliman's American Journal*, January 1853.

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STRUCTURE OF THE CELLS OF PLANTS.

Physiologists are at the present day almost unanimous in their notions of the normal structure of the cells of plants. An outer